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09/893,248	06/27/2001	Masatsugu Suwabe	09792909-5087	1879

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EXAMINER	
UHLIR, NIKOLAS J	
ART UNIT	PAPER NUMBER
1773	

DATE MAILED: 01/21/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

A8

Office Action Summary	Application No.	Applicant(s)
	09/893,248	SUWABE, MASATSUGU
	Examiner	**Art Unit**
	Nikolas J. Uhlir	1773

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *01 December 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8* is/are pending in the application.

4a) Of the above claim(s) *5-8* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .

4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: .

DETAILED ACTION

1. This office action is in response to the amendment/request for continued examination dated 12/01/2003. Applicant's amendment to insert new limitations with respect to the substrate utilized by the claimed magneto-optical recording medium are sufficient to overcome all of the prior applied rejections. Accordingly, these rejections are hereby withdrawn. However, the case is not in condition for allowance in lieu of the new grounds of rejection presented below. Currently, claims 1-8 are pending, with claims 5-8 withdrawn from consideration.

Claim Rejections - 35 USC § 103

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. Claims 1 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishimura (US5717662) in view of Shimazaki et al. (US5637411), further in view of Horie et al. (US5581539).

4. Claim 1 requires a magnetically induced super resolution-type (MSR) magneto-optical recording medium comprising on a light transmitting substrate, a recording layer for recording and retaining information therein, a read-out layer for copying therein the information retained in the recording layer during reproduction of the information, and an exchange coupling breaking layer between the recording layer and the read-out layer, wherein a first surface of the exchange coupling breaking layer contacts the recording layer and a second surface of the exchange coupling breaking layer opposite the first surface is in contact with the read out layer, wherein the exchange coupling layer

comprises a layer of a nitride of either one of GdFeCo or TbFeCo, and said substrate is a land groove substrate wherein information can be written to at least one of the groove areas or land areas of the substrate.

5. The examiner notes that claim 1 as written, aside from requiring an exchange coupling breaking layer positioned between and in contact with both a recording layer and a reproducing layer, does not require the recording or reproducing layer to have a specific position with respect to the substrate. Thus, the examiner interprets claim 1 to allow for either the recording or the reproducing layer to be disposed closer to the substrate (i.e. both near field and far field type media read on the instant claims). Further, the examiner notes that the term "comprising" in line 2 of claim 1 is open language and thus allows for additional layers aside from those specifically required by claim 1 to be present in the structure. Last, the examiner notes that the applicant in claim 1 requires the exchange-coupling layer to "comprise" a layer of a nitride of either GdFeCo or TbFeCo, and requires the exchange coupling breaking layer to have a first surface in contact with the recording layer and a second surface in contact with the reproducing layer. The examiner interprets these limitations as open to allowing the exchange coupling layer to be made of many layers of differing materials, so long as one of those layers is a nitride of GdFeCo or TbFeCo, as "comprises a layer" is open language and allows for other layers besides the nitride layer to be present. Thus, a piece of prior art utilizing an intermediate layer of GdFeCo that has been modified to form a nitride layer on its surface reads on the applicants claims, so long as the

modified intermediate layer has a surface (modified or not) in contact with the recording layer, and a surface (modified or not) in contact with the read out layer.

6. Bearing the above interpretation in mind, with respect to the limitations of claim 1, Nishimura teaches magneto-optical recording media that are capable of utilizing magnetically induced super resolution, as shown by figure 6a. In a specific example, Nishimura forms on the surface of a light transmitting substrate (column 7, lines 40-41), a SiN dielectric layer, a 10nm thick GdFeCo reproducing layer (equivalent to applicants claimed reproducing layer), a 5nm thick GdFeCO intermediate layer, a 12nm thick TbFeCo recording layer, a 30nm thick SiN layer dielectric layer, and a 60nm thick Al reflection layer in this order (column 24, lines 45-53 and figure 7c) on the surface of a light transmitting substrate (column 7, lines 40-41). The intermediate layer is utilized as an exchange coupling breaking layer (column 12, lines 43-60). Thus, the examiner takes the position that the intermediate layer of Nishimura reads on the applicant's required exchange coupling breaking layer.

7. Nishimura fails to teach utilizing an exchange coupling breaking layer comprising a layer of a nitride of either TbFeCo or GdFeCo, as required by claim 1.

8. However, with respect to this deficiency, Shimazaki et al. (Shimazaki) teaches a MSR type magneto-optic recording medium comprising three magnetic layers, wherein the second magnetic layer is disposed between the first and 2nd magnetic layers (figures and column 9, lines 5-17, column 38, lines 1-19). Shimazaki teaches that external magnetic field sensitivity of the media is improved by forming an oxide or nitride layer on the surface of at least one of the three magnetic films constituting the medium,

wherein the oxide or nitride layer is obtained by heat treating the desired magnetic film in a vacuum chamber containing a controlled amount of oxygen or nitrogen (column 11, line 40-column 12, line 5). It is noted that this method is very similar if not identical to that utilized by the applicant in the instant specification for forming the nitride films. Thus, it is clear that the nitride or the oxide film formed will be an oxide or a nitride of the alloy that comprises the magnetic layer that is heated in the nitrogen or oxygen-containing atmosphere.

9. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to heat treat the GdFeCo intermediate layer taught by Nishimura in a vacuum chamber containing a controlled amount of nitrogen as taught by Shimazaki, to form a layer of GdFeCo nitride (GdFeCoN) on a surface of the GdFeCo film.

10. One would have been motivated to make this modification in light of the teaching in Shimazaki that the external field sensitivity of an MSR medium having a similar structure to that disclosed by Nishimura is improved by heat treating on of the three magnetic films in a vacuum chamber containing a controlled amount of oxygen or nitrogen, resulting in the formation of an oxide or nitride layer on the surface of the film. One would have specifically selected to heat the GdFeCo intermediate layer of Nishimura in the presence of nitrogen in light of the fact that Shimazaki recognizes the equivalence of nitriding the surface of the intermediate layer to nitriding or oxidizing the surface of the recording or reproducing layer as a suitable means for improving the external magnetic sensitivity of the medium. The applicant is reminded that it has been

held that substitution of equivalents requires no express motivation so long as the prior art recognizes the equivalency.

11. It is the examiners position that the GdFeCo layer having a GdFeCo nitride (GdFeCoN) layer on a surface is equivalent to the applicants exchange coupling breaking layer. The GdFeCo/GdFeCoN structure has a surface in contact with the recording layer and a surface in contact with the reproducing layer, and comprises a nitride of GdFeCo.

12. However, Nishimura as modified by Shimazaki still fail to teach the land groove substrate required by claim 1.

13. With respect to this deficiency, Horie et al. (Horie) teaches that typically, optical disks such as magneto-optical recording medium utilize a subtrate that has land areas and groove areas on its surface. Typically, information is recorded in one or both of the land area or groove area. When information is only recorded in one of these areas (thereby forming a track), the non-recorded area serves a boundary separating adjacent tracks. This separation reduces the amount of signal leakage between tracks. If both the land and groove areas are recorded to, the recording density of the medium is doubled (see column 1, lines 20-25, column 2, lines 62-68, and column 3, lines 10-29).

14. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the land groove substrate taught by Horie as the substrate utilized by the magneto-optical medium of Nishimura as modified by Shimazaki.

15. One would have been motivated to make this modification due to the teaching in Horie that land/groove substrates are commonly used as substrate for magneto-optical media, and depending on whether one or both of the land or groove contain recorded information, the media can either exhibit reduced signal leakage between tracks or improved recording density.

16. Claim 3 requires the exchange coupling breaking layer to have a thickness between 1 atom layer thick and 100 angstroms. The specific Nishimura example cited above utilizes a 5nm (50 angstrom) GdFeCo intermediate layer. It is clear that the modification of this intermediate layer via the nitriding procedure detailed in Shimazaki will convert a portion of this layer into GdFeCoN. Thus, as no additional material is deposited, and 50 angstroms is completely encompassed within the applicants claimed range, this limitation is met.

17. Claims 2 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hiroki et al. (US5790513) in view of Shimazaki et al. (US5637411), further in view of Horie et al.

18. Claim 2 requires a MSR type magneto-optic recording medium comprising on a light transmitting subtrate, at least a recording layer for recording and retaining information, a read out layer for copying the information retained in the recording layer during reproduction of the information, and a read-out auxiliary layer disposed between the recording layer and the read out layer and in contact with the recording layer, wherein an exchange coupling breaking layer is disposed between the said read out auxiliary layer and the recording layer, wherein a first surface of the exchange coupling

breaking layer is disposed in contact with the read out auxiliary layer and a second surface of the exchange coupling breaking layer opposite the first surface is in contact with the read out layer, wherein the auxiliary read out layer comprises GdFe and the exchange coupling breaking layer comprises a layer of a nitride of either GdFe or TbFeCo.

19. Regarding these limitations, Hiroki et al. (Hiroki) teaches a magneto-optical recording medium comprising a transparent substrate 1, and interference layer 2, a magnetic reproduction layer 3 (equivalent to applicants claimed reproduction layer), a magnetic intermediate layer 4, a magnetic recording layer 5, and a protective layer 6, wherein the layers are formed in the order recited (column 5, lines 35-50 and figure 3). The intermediate layer functions to control the exchange coupled state between the reproduction layer and the memory layer (column 6, lines 63-65). Although Hiroki doesn't specifically teach that the intermediate layer is a reproducing auxiliary layer, Hiroki does teach the reproducing auxiliary layers function to adjust the exchange coupling force or magneto static coupling force of the medium (column 7, lines 20-27). Thus, given the fact that the intermediate layer functions to control the amount of exchange coupling force between the reproducing and recording layers, the examiner takes the position that this layer is equivalent to a reproducing auxiliary layer, and thus is equivalent to applicants claimed reproducing auxiliary layer. In a specific example, Hiroki teaches forming a magneto-optic recording medium having a transparent substrate, a SiN dielectric layer on the substrate, a 40nm thick GdFeCo reproduction layer on the SiN dielectric layer, a 10nm thick GdFe intermediate layer on the

reproduction layer, and a 35nm thick TbFeCo recording layer on the intermediate layer (column 13, lines 15-40).

20. Hiroki does not teach utilizing an exchange coupling breaking layer comprising a nitride of either GdFe or TbFeCo between the read out layer and the read out auxiliary layer, as required by claim 2.

21. However, with respect to this deficiency, Shimazaki teaches a MSR type magneto-optic recording medium comprising three magnetic layers, wherein the second magnetic layer is disposed between the first and 2nd magnetic layers (figures and column 9, lines 5-17, column 38, lines 1-19). Shimazaki teaches that external magnetic field sensitivity of the media is improved by forming an oxide or nitride layer on the surface of at least one of the three magnetic films constituting the medium, wherein the oxide or nitride layer is obtained by heat treating the desired magnetic film in a vacuum chamber containing a controlled amount of oxygen or nitrogen (column 11, line 40-column 12, line 5). It is noted that this method is very similar if not identical to that utilized by the applicant in the instant specification for forming the nitride films. Thus, it is clear that the nitride or the oxide film formed will be an oxide or a nitride of the alloy that comprises the magnetic layer that is heated in the nitrogen or oxygen-containing atmosphere.

22. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to heat the GdFe intermediate layer of Hiroki in the presence of nitrogen as taught by Shimazaki such that a nitride of GdFe formed between the GdFe intermediate layer and the GdFeCo reproducing layer.

23. One would have been motivated to make this modification in light of the teaching in Shimazaki that the external magnetic field sensitivity of a magneto-optic recording medium comprising three magnetic layers is improved by nitriding the surface of on of the three magnetic layer by heating the layer in an atmosphere containing nitrogen such that a layer of nitride forms on the surface of the layer. One would have specifically chosen to expose the surface of the GdFe film that that is to be in contact with the reproducing layer in Hiroki in light of the fact that Shimazaki recognizes the equivalence of nitriding any surface of at least one magnetic film in the media as a suitable means for improving the external magnetic field sensitivity of the medium. One would have specifically elected to expose the film to nitrogen in light of the fact that Shimazaki recognizes the equivalence of nitride layers to oxide layers for the purpose of enhancing external magnetic field sensitivity.

24. Regarding the requirement in claim 2 requiring the GdFe nitride film to be an exchange coupling breaking layer. Although this limitation is not expressly taught, it is the examiners position that this limitation is met by Hiroki as modified by Shimazaki, although it is not expressly taught, as the GdFeN formed by the combination of these references meets all of the compositional requirements of the intermediate layer required by claim 2. It has been held that where claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a *prima facie* case of either anticipation or obviousness has been established and the burden of proof is shifted to applicant to show that prior art products do not necessarily on inherently possess characteristics of

claimed products. The *prima facie* case can be rebutted by ***evidence*** showing that the prior art products do not necessarily possess the characteristics of the claimed product.

25. However, Hiroki as modified by Shimazaki still fails to teach the land groove substrate required by claim 2.

26. With respect to this deficiency, Horie et al. (Horie) teaches that typically, optical disks such as magneto-optical recording medium utilize a subtrate that has land areas and groove areas on its surface. Typically, information is recorded in one or both of the land area or groove area. When information is only recorded in one of these areas (thereby forming a track), the non-recorded area serves a boundary separating adjacent tracks. This separation reduces the amount of signal leakage between tracks. If both the land and groove areas are recorded to, the recording density of the medium is doubled (see column 1, lines 20-25, column 2, lines 62-68, and column 3, lines 10-29).

27. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the land groove substrate taught by Horie as the substrate utilized by the magneto-optical medium of Nishimura as modified by Shimazaki.

28. One would have been motivated to make this modification due to the teaching in Horie that land/groove substrates are commonly used as substrate for magneto-optical media, and depending on whether one or both of the land or groove contain recorded information, the media can either exhibit reduced signal leakage between tracks or improved recording density.

29. The limitations of claim 4 require the exchange-coupling layer to have a thickness between 1 atom layer and 100 angstroms.

30. Regarding this limitation, the specific Hiroki example cited above utilizes a 10nm (100 angstrom) GdFe intermediate layer. It is clear that the modification of this intermediate layer via the nitriding procedure detailed in Shimazaki will convert a portion of this layer into GdFeN, resulting in a layer equivalent to applicants claimed exchange coupling breaking layer. As it is clear that this process merely converts a portion of the existing GdFe layer to GdFeN (as opposed to depositing an additional GdFeN layer), and the GdFe layer has a thickness of 100 angstroms, the maximum thickness of the GdFe layer is 100 angstroms. Further, as Shimazaki clearly teaches that the process forms a nitride layer, it is the examiners position that this nitride layer must be at least 1 atom layer thick. Thus, as this range is completely encompassed within the applicants claimed range, the limitations of claim 4 are met.

Response to Arguments

31. Applicant's arguments with respect to claims 1-4 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nikolas J. Uhlir whose telephone number is 703-305-0179. The examiner can normally be reached on Mon-Fri 7:30 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Thibodeau can be reached on 703-308-2367. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9310.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-0389.

Nju

Paul Thibodeau
Supervisory Patent Examiner
[illegible]